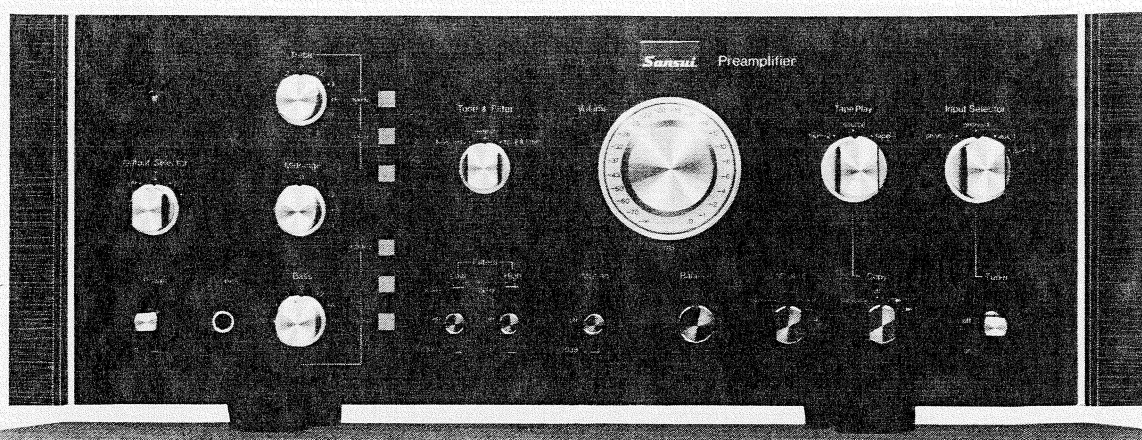
SERVICE MANUAL

PREAMPLIFIER

SANSUI CA-2000



Sansui

SANSUI ELECTRIC CO., LTD.

Sansui

This service manual is designed for service engineers to repair, adjust, maintain and order the replacement parts of the CA-2000 correctly.
When ordering the parts, use the stock number and parts name specifically referring to the Parts Location and Parts Lists.
For general usage and maintenance of the unit, please refer to the Operating Instructions attached with the unit.

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1. SPECIFICATIONS

OUTPUT VOLTAGE
- OUTPUT .....1.0 V (rated)
  (Maximum output level: 12 V at 1 kHz with no more than 0.1% total harmonic distortion)
- TAPE REC-1, 2 (Pin jacks)..150 mV
- TAPE-2 REC/PLAY (DIN socket) .....30 mV

TOTAL HARMONIC DISTORTION .....less than 0.03%

INTERMODULATION DISTORTION (70 Hz: 7,000 Hz=4: 1 SMPTE method) .....less than 0.03%

FREQUENCY RESPONSE (at rated output) .....10 Hz to 80 kHz $^{+0.5}_{-1.0}$ dB

RIAA CURVE DEVIATION (PHONO) .....+0.2dB, −0.2dB (20 Hz to 20 kHz)

INPUT SENSITIVITY AND IMPEDANCE (1 kHz for rated output)
- PHONO-1 .....2 mV, 4 mV, 8 mV/30 kΩ, 50 kΩ, 100 kΩ
  (Maximum input capability: 1V at 1 kHz, less than 0.1% distortion and PHONO SENSITIVITY switch at 8 mV)
- PHONO-2 .....2 mV/50 kΩ
- AUX .....150 mV/50 kΩ
- TUNER .....150 mV/50 kΩ
- TAPE PLAY-1, 2 (Pin jacks) 150 mV/50 kΩ
- TAPE-2 REC/PLAY (DIN socket) .....150 mV/50 kΩ

HUM AND NOISE (IHF)
- PHONO-1 .....better than 75 dB
  (Input sensitivity switch at 4 mV)
- AUX .....better than 90 dB
- TUNER .....better than 90 dB
- TAPE PLAY-1,2 .....better than 90 dB

CONTROLS
- BASS .....±10 dB (30 Hz)
  TONE SELECTOR (turnover frequencies) .....150 Hz, 300 Hz, 600 Hz
- MIDRANGE .....±5 dB (1.5 kHz)
- TREBLE .....±10 dB (20 kHz)
  TONE SELECTOR (turnover frequencies) .....2 kHz, 4 kHz, 8 kHz
- LOW FILTER .....−3 dB (20 Hz), 12 dB/oct.
  −3 dB (60 Hz), 12 dB/oct.
- HIGH FILTER .....−3 dB (7 kHz), 6 dB/oct.
  −3 dB (12 kHz), 12 dB/oct.
- MUTING .....0 dB, −20 dB

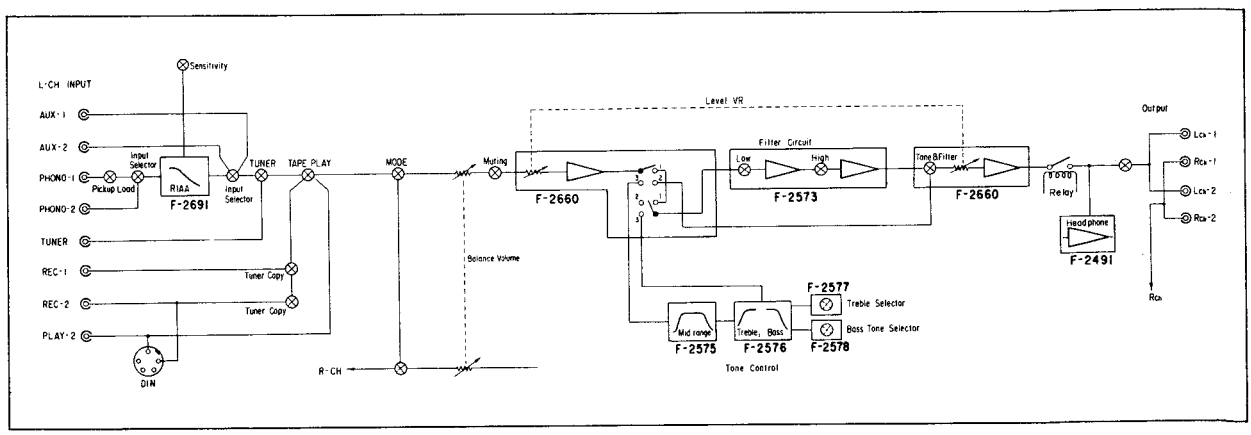
POWER REQUIREMENTS
- POWER VOLTAGE.....100, 120, 220, 240 V, 50/60 Hz
  120 V (Usable 110-130 V), 60 Hz for U.S.A. & Canada
- POWER CONSUMPTION..26 Watts

DIMENSIONS .....460 mm (18 1/8") W
160 mm (6 5/16") H
310 mm (12 1/4") D

WEIGHT .....9.9 kg (21.8 lbs) net
11.6 kg (25.6 lbs) packed

* Design and specifications subject to change without notice for improvements.

2. BLOCK DIAGRAM



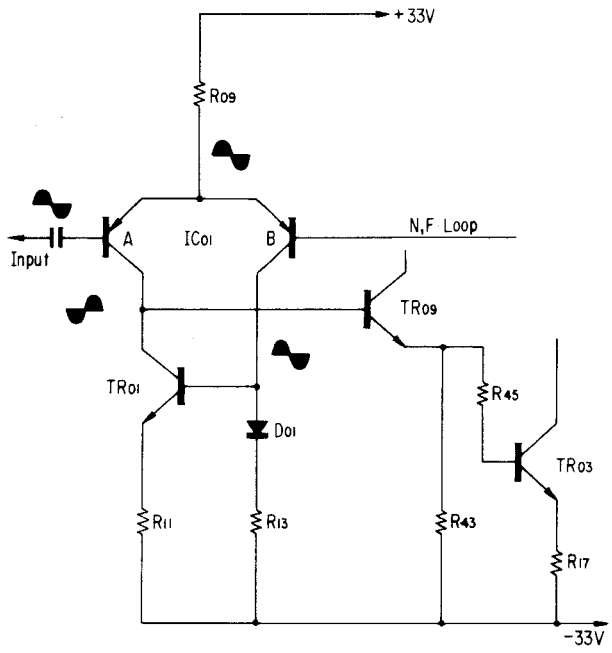
3. OPERATIONS OF NEW CIRCUITS

3-1. Current Mirror Circuit

◇Purpose of use in ♯ CA-2000

By adding current mirror section to balanced-type signal amplifier as Fig. 3-1, the current mirror circuit is effective to improve signal to noise ratio, distortion factor and direct current stability.

Fig. 3-1 Current Mirror Circuit on F-2691 Equalizer Circuit Board



◇Advantages

1. By operation of differential amplification in this driver stage, the current mirror circuit is efficient to reduce the influence of the power line voltage deviation and *Common Mode Rejection Ratio (C.M.R.R.).

   $$* \text{C.M.R.R.(dB)} = \frac{\text{Differential Gain}}{\text{Common Mode Gain}}$$

2. By basic functions of push-pull amplifier in this circuit, lower distortion factor is obtained.
3. Since the output impedance of this circuit can be kept extremely high, considerable high gain is obtained.

◇Operation

This Current Mirror Circuit is composed of two semiconductors, TR01 & Diode D01 using as the current mirror section, and a IC01 using as the balanced-typed signal amplifier as shown in Fig. 3-1. The transistor, TR01, and transistor A of first stage built in the IC operate as a pushpull amplifier.

◇Phase Characteristics

When input signal shown in Fig. 3-1. is supplied to the base of the transistor A in the IC in normal operation,

1. Out-of phase signal against the input signal appears at the collector of transistor A.
2. In-phase output signal against the input one appears at the emitter of transistor A.
3. Since the base of transistor B built in the IC is grounded in AC equivalent circuit, transistor B operates as the function of common -base circuit; therefore, the signal appeared at collector of transistor B is in-phase signal against signal appeared at emmiter of transistor B.
4. The signal appeared at collector of transistor B is given to the base of TR01. The signal appeared at collector of TR01 is out-of phase to the signal at collector of transistor B and is in-phase signal at collector of transistor A.
   Thus, the combination of transistor A and TR01 is used as operation of push-pull amplifier.

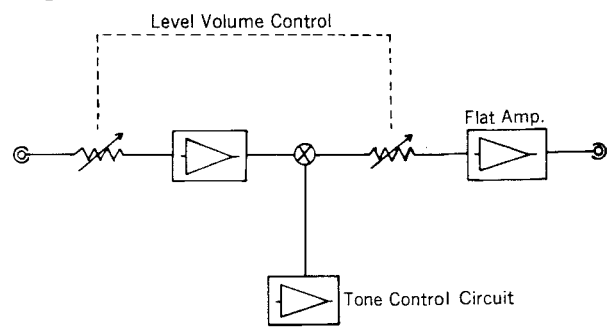
◇Open Loop Gain

The open loop gain of conventional diffrential amplifier itself is approximately 30dB to 35dB in normal operation; furthermore, by adding the current mirror circuit in series to conventional differential amplifier, it is possible to obtain high open loop gain, approximately 70dB to 80dB. Consquently, the gain 40dB to 50dB, is able to add to negative feedback loop by using the current mirror circuit in order to improve distortion factors.

3-2. Four-gang Level Volume Control

This unit is equipped with four-gang level volume control for the purpose of the following reason.
Conventional 2-channel stereo control amplifier adopts twin (two)-gang level volume control connecting with the input side of tone control circuit. Therefore, noise components existing in equalizer circuit can be gradually decreased by turning level volume control downward, but noises occured in tone control circuit appears direct to output speaker terminals. To eliminate the noises existing in tone control circuit to speaker terminals at a certain low level of volume control, this model, CA-2000 adopts four-gang level volume control which connects with both output and input sides of tone control circuit individually for 2-channel stereo function.

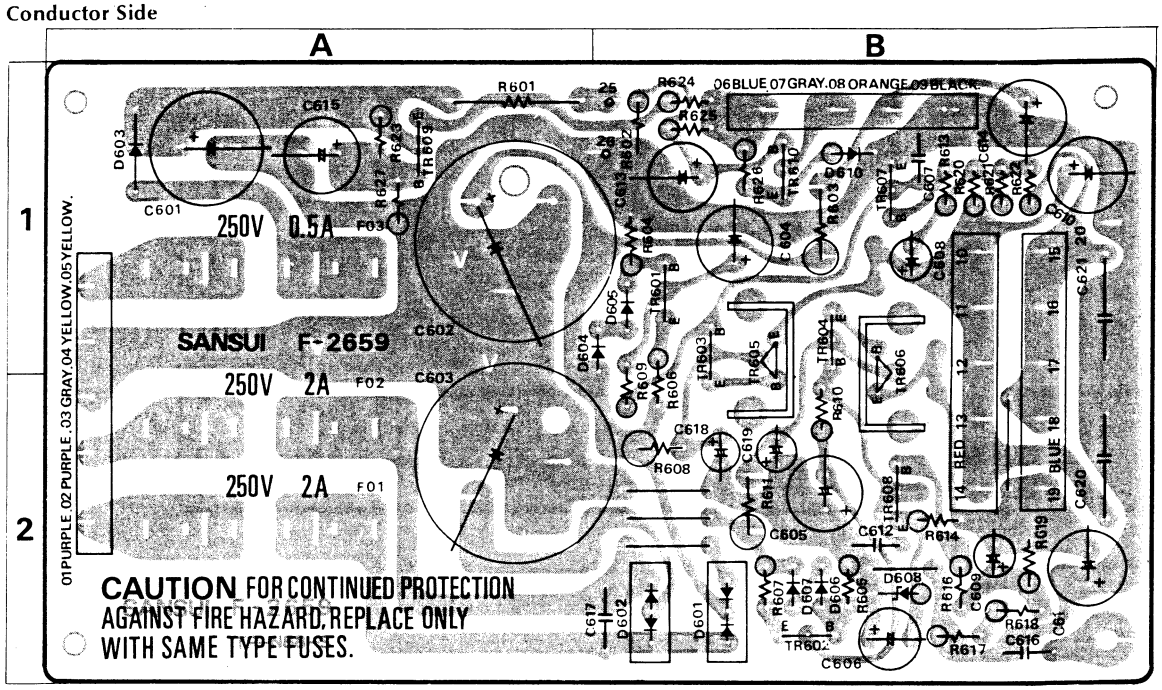
Fig. 3-2 Level Volume Control on one-channel



4. PARTS LOCATION & PARTS LIST

4-1. F-2659 Power Supply Circuit Board (Stock No. 7502101)

Conductor Side



Parts List

Parts No.	Stock No.	Description	Position
TR601	0300470, 1	2SA726 Ⓦ (F, G)	1 B
TR602	0306070, 1	2SC1313 (F, G)	2 B
TR603	0306070, 1	2SC1313 (F, G)	1, 2 B
TR604	0300470, 1	2SA726 Ⓦ (F, G)	1 B
TR605	0308450, 1 or 0308611, 2	2SD356 (C, D) or 2SD357 (D, E)	1, 2 B
TR606	0303280, 1 or 0303441, 2	2SB526 (C, D) or 2SB527 (D, E)	1, 2 B
TR607	0306070, 1	2SC1313 (F, G)	1 B
TR608	0300470, 1	2SA726 Ⓦ (F, G)	2 B
TR609	0306070, 1	2SC1313 (F, G)	1 A
TR610	0306070, 1	2SC1313 (F, G)	1 B
D601	0310800 or 0311180	10DC2 or 1S1588	2 B

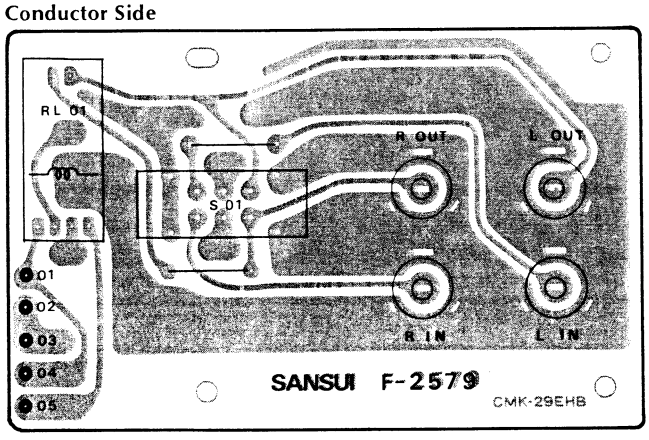
(TR601–TR610: Transistor)

Parts No.	Stock No.	Description	Position
D602	0310801	10DC2R (Diode)	2 B
D603	0310340	10D1 (1S2226) (Diode)	1 A
D604	0340120	VD1212 (Voristor)	1 B
D605	0340120	VD1212 (Voristor)	1 B
D606	0340120	VD1212 (Voristor)	2 B
D607	0340120	VD1212 (Voristor)	2 B
D608	0316250	RD-10E (B) Zener Diode	2 B
D610	0311180	1S1588 or 1S2473D (Diode)	1 B
C602	0549206	1000/rF 63V E.C.	1 A
C603	0549206	1000/rF 63V E.C.	2 A
C617	0655103	10000 pF 500V C.C.	2 B
C620	0602109	1.0/rF 100WV M.C.	2 B
C621	0602109	1.0/rF 100WV M.C	1 B
R601	0104152	1.5kΩ 1 W C.R.	1 A

Parts No.	Stock No.	Description	Position
R603	0202101	100Ω 2 W M.C.	1 B
R608	0201121	120Ω 1 W M.C.	2 B
R611	0201121	120Ω 1 W M.C.	2 B
F01	0431240 or 0432240	2A 250V or 2A 250V (AC Fuse)	2 A
F02	0431240 or 0432240	2A 250V or 2A 250V (AC Fuse)	2 A
F03	0431210 or 0432210	0.5A 250V or 0.5A 250V (AC Fuse)	1 A

4-2. F-2579 Pre-Main Switch Circuit Board (Stock No. 7594591)

Conductor Side

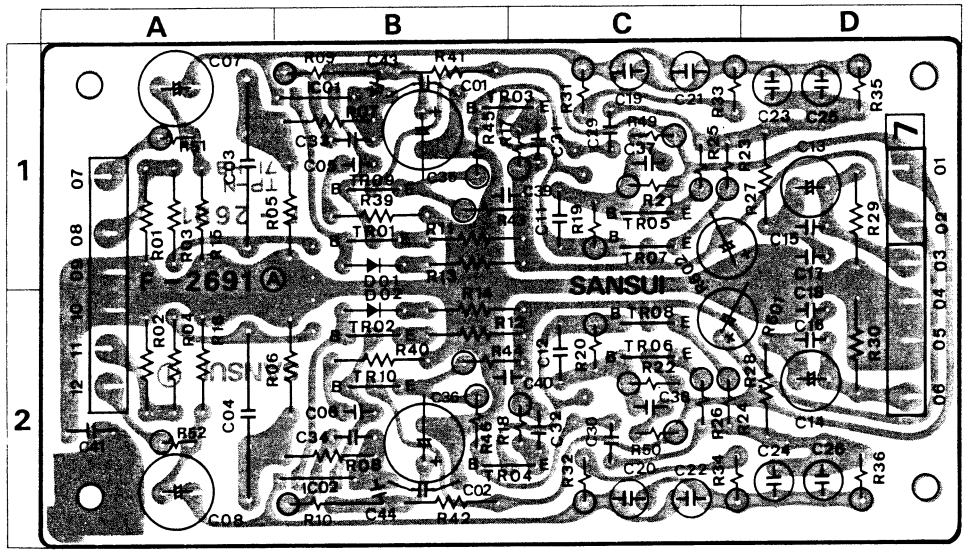


Parts List

Parts No.	Stock No.	Description
D01	0311160 or 0311180	1S2473D or 1S1588 (Diode)
RL01	1150320	Relay Switch
	2430260	Famale Pin Jack (White)
	2430270	Famale Pin Jack (Red)

4-3. F-2691 Equalizer Circuit Board (Stock No. 7551031)

Conductor Side



Parts List

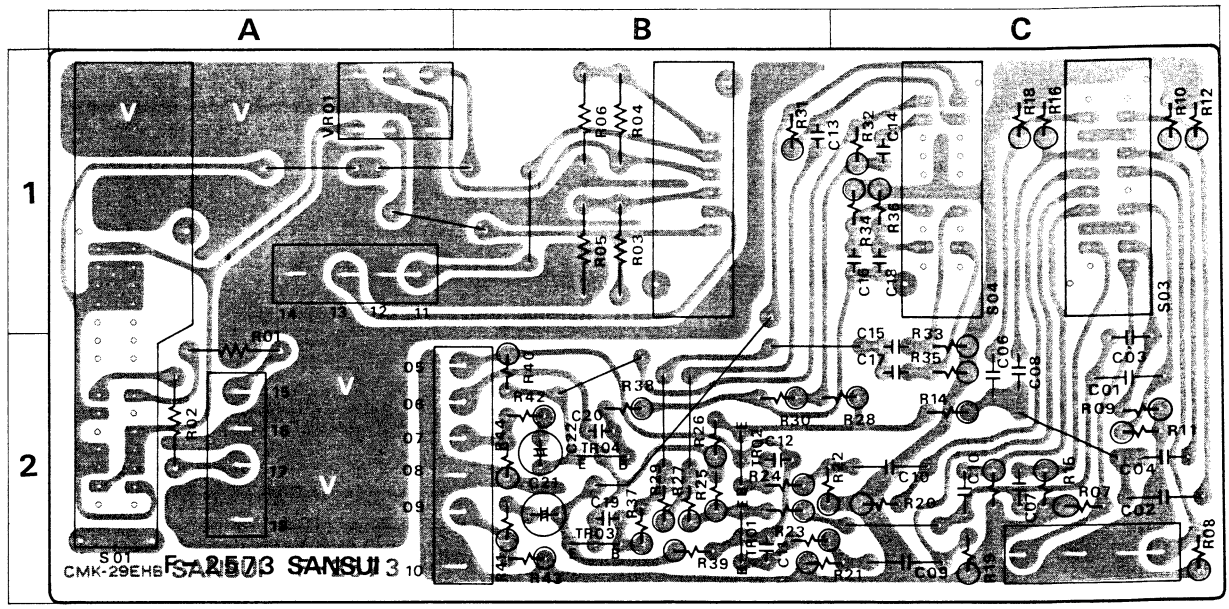
Parts No.	Stock No.	Description	Position
TR01, 02	0306070, 2	2SC1313 (F, G) } Transistor	1 C . 2 C
TR03, 04	0306270, 1	2SC1708 (F, G)	1 B , C
TR05, 06	0306270 or 0306271	2SC1708 (F) or 2SC1708 (G) } Transistor	1 B . 2 B
TR07, 08	0300710 or 0300711	2SA847 (F) or 2SA847 (G) } Transistor	1 B . 2 B
TR09, 10	0306270, 1	2SC1708 (F, G) } Transistor	1 C . 2 C

Parts No.	Stock No.	Description	Position
IC01, 02	0360370, 1	2SA798 (F, G) Transistor	1 C . 2 C
D01, 02	0311160 or 0311180	1S2473D or 1S1588 } Diode	1 C . 2 C
C03, 04	0602229	2.2/rf 100WV M.C.	1 D . 2 D
C19, 20	0625562	5600pF } 50V P.C.	1 B . 2 B
C21, 22	0620101	100pF } 50V P.C.	1 B . 2 B
C23, 24	0625122	1200pF } 50V P.C.	1 B . 2 B

Parts No.	Stock No.	Description	Position
C25, 26	0620391	390pF 50V P.C.	1 A . 2 A
R15, 16	0231332	3.3kΩ } ½W M.R.	1 D . 2 D
R31, 32	0231223	22kΩ } ½W M.R.	1 B . 2 B
R33, 34	0231564	560kΩ } ½W M.R.	1 B . 2 B
R35, 36	0231473	47kΩ } ½W M.R.	1 A . 2 A
R51, 52	0231102	1.0kΩ } ½W M.R.	1 D . 2 D

4-4. F-2573 Filter Accessory Circuit Board (Stock No. 7561581)

Conductor Side



Parts List

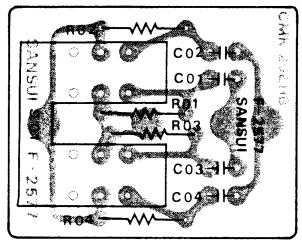
Parts No.	Stock No.	Description	Position
TR01, 02	0306270, 1	2SC1708 (F, G) } Transistor	2 B
TR03, 04	0300760, 1	2SA917 (1, 2) } Transistor	2 B
C15, 16	0620821	820pF 50V P.C.	2 C . 1 C

Parts No.	Stock No.	Description	Position
VR01	1015170, 1	250kΩ (M, N) Balance Volume	1 A
S01	1190250	Mode Switch	1, 2 A
S02	1170770	Muting Switch	

Parts No.	Stock No.	Description	Position
S03	1170950	Low Filter Switch	1 C
S04	1170950	High Filter Switch	1 C
	2410590	4P Pin Ass'y (Type D)	
	2410910	2P Pin Ass'y (Type E)	

4-5. F-2577 Treble Tone Selector Circuit Board (Stock No. 7561611)

Conductor Side

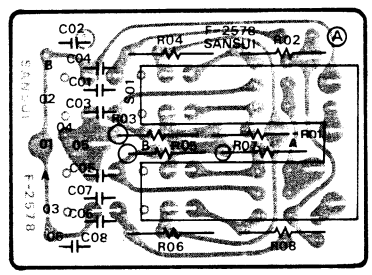


Parts List

Parts No.	Stock No.	Description
C01, 02	0620331	330pF } 50V P.C.
C03, 04	0620911	910pF }
S01	1131150	Treble Tone Push Switch

4-6. F-2578 Bass Tone Selector Circuit Board (Stock No. 7561621)

Conductor Side

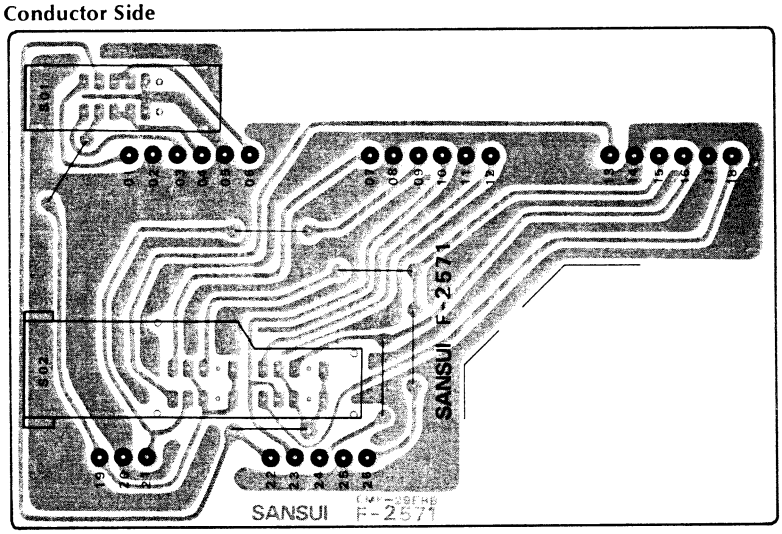


Parts List

Parts No.	Stock No.	Description
S01	1131140	Bass Tone Push Switch

4-7. F-2571 Tape Copy & Tuner Signal Switching Circuit Board (Stock No. 7594561)

Conductor Side

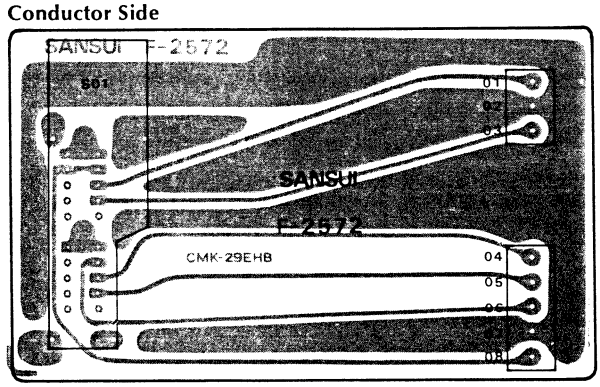


Parts List

Parts No.	Stock No.	Description
S01	1170870	Lever Switch, tuner
S02	1190280	Tape Copy Switch

4-8. F-2572 Tape Play Circuit Board (Stock No. 7594571)

Conductor Side

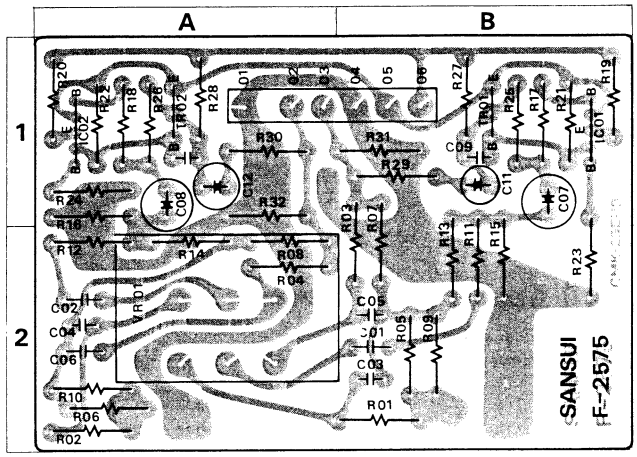


Parts List

Parts No.	Stock No.	Description
S01	1190270	Tape Play switch
	2410760	3P Pin Ass'y (Type C)
	2410780	6P Pin Ass'y (Type C)

4-9. F-2575 Midrange Tone Control Circuit Board (Stock No. 7561591)

Conductor Side

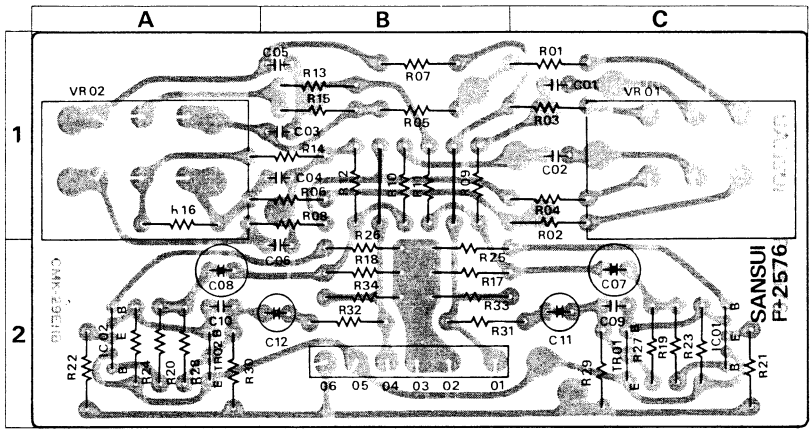


Parts List

Parts No.	Stock No.	Description	Position
TR01, 02	0306270, 1	2SC1708 (F, G) Transistor	2 A , 2 B
IC01, 02	0360290, 1	2SA798 (F, G) IC	2 A , 2 B
VR01	1090150, 1	50kΩ (B) × 2 Midrange Volume	1 B
	2410700	6P Pin Ass'y (Type F)	

4-10. F-2576 Bass & Treble Tone Control Circuit Board (Stock No. 7561601)

Conductor Side

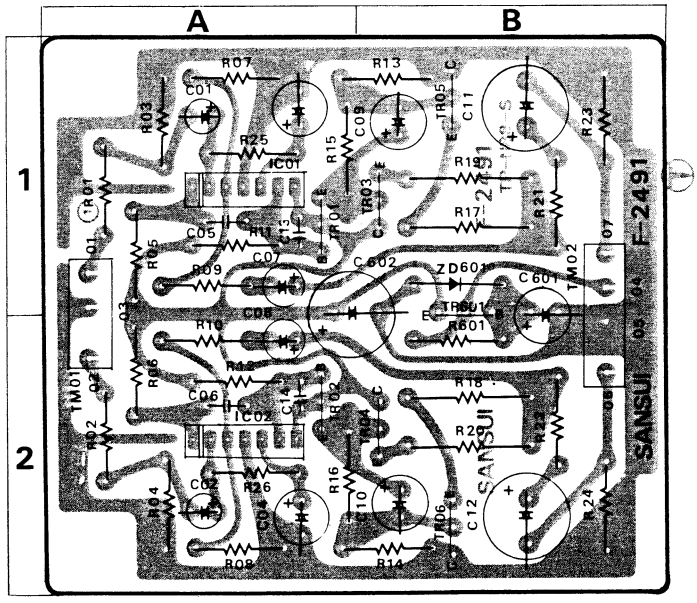


Parts List

Parts No.	Stock No.	Description	Position
TR01, 02	0306270, 1	2SC1708 (F, G) Transistor	2 C , 2 A
IC01, 02	0360290, 1	2SA798 (F, G) IC	2 C , 2 A
C01, 02	0620301	300pF 50V P.C.	1 C
VR01	1090150, 1	50kΩ (B) · 2 Treble Volume	1 C
VR02	1090150, 1	50kΩ (B) · 2 Bass Volume	1 A
	2410700	6P Pin Accessory (Type F)	

4-11. F-2491 Circuit Board for Headphone (Stock No. 7594601)

Conductor Side

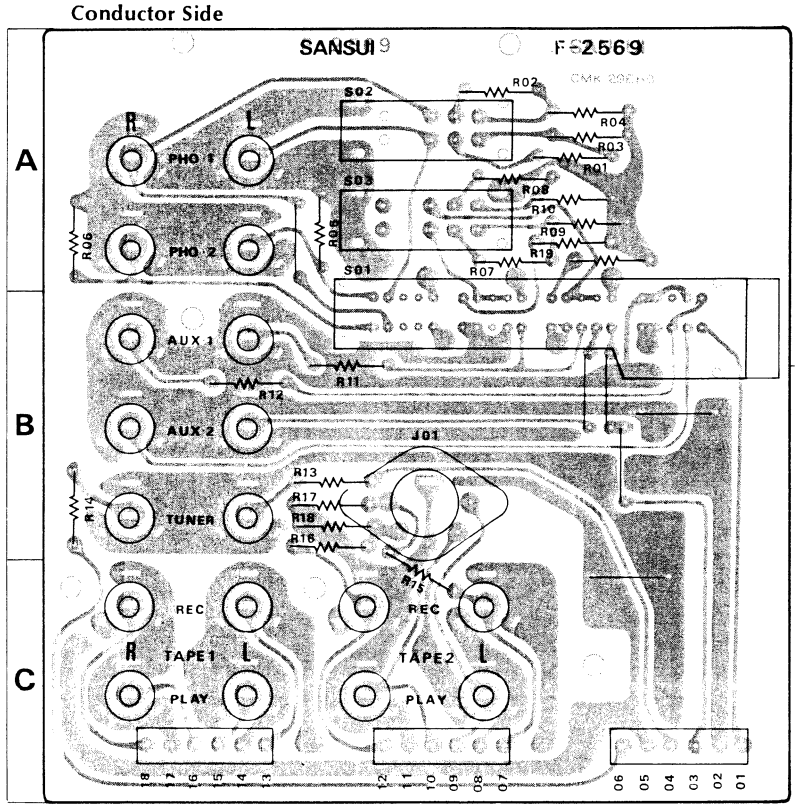


Parts List

Parts No.	Stock No.	Description	Position
TR01, 02	0306070, 1	2SC1313 (F, G)	1 A , 2 A
TR03, 04	0305901, 2	2SC1124 (2, 3) Transistor	1 B , 2 B
TR05, 06	0300391, 2	2SA706	1 B , 2 B
TR601	0308450, 1	2SD356 (C, D)	1 B
IC01, 02	0360190	BA312	1 A , 2 A
D601	0316600	RD36E (C)	
R17, 18	0104330 or 0211330	33Ω 1 W C.R. or 33Ω 1 W M.R.	1 B , 2 B
R19, 20	0104330 or 0211330	33Ω 1 W C.R. or 33Ω 1 W M.R.	1 B , 2 B
R21, 22	0103100	10Ω ½W C.R.	1 B , 2 B
R23, 24	0103331	330Ω ½W C.R.	1 B , 2 B
	2410580	3P Pin Ass'y (Type D)	
	2410590	4P Pin Ass'y (Type D)	

4-12. F-2569 Input Terminal & Switch Circuit Board (Stock No. 7594551)

Conductor Side

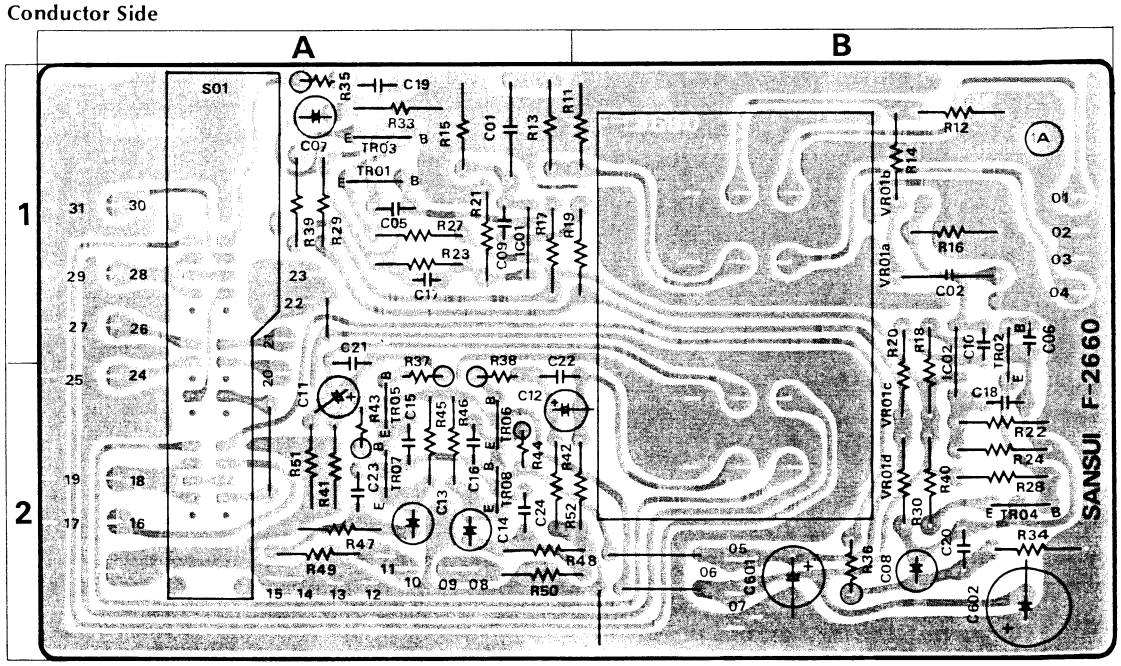


Parts List

Parts No.	Stock No.	Description	Position
R07, 08	0231202	2.0kΩ 1/2W M.R.	A
S01	1190260	Input Selector Switch	A, B
S02	1110310	Pick-up Load Switch	A
S03	1110310	Sensitivity Switch	A
J01	2090030	5P DIN Socket	B
	2410780	6P Pin Ass'y (Type C)	
	2430260	1P Jack (White)	
	2430270	1P Jack (Red)	

4-13. F-2660 Level Volume Control Circuit Board (Stock No. 7594581)

Conductor Side



Parts List

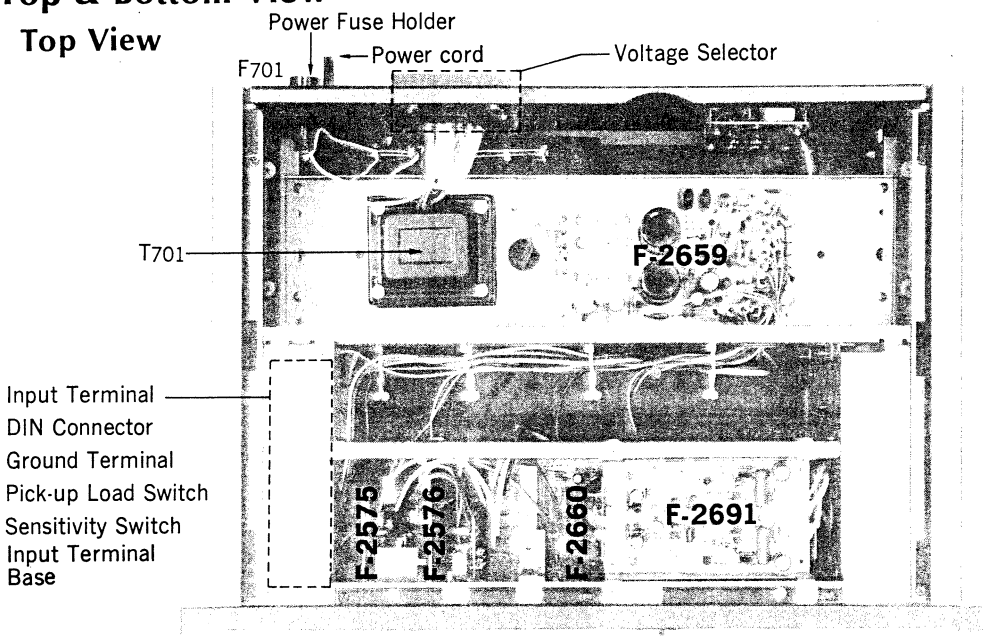
Parts No.	Stock No.	Description	Position
TR01, 02	0306270, 1	2SC1708 (F, G)	1A, 1, 2B
TR03, 04	0306360, 1	2SC1951 (1, 2)	1A, 2B
TR05, 06	0300470, 1	2SA726 Ⓦ (F, G) Transistor	2A
TR07, 08	0306070, 1	2SC1313 (F, G)	2A
IC01, 02	0360370, 1	2SA798 (F, G)	1A, 1, 2B

Parts No.	Stock No.	Description	Position
C01, 02	0602109, 1	1/rF 100V M.C.	1A, 1B
VR01	1090220	100kΩ × 4 Detent Volume	
S01	1190290	Tone & Filter Switch	1, 2A

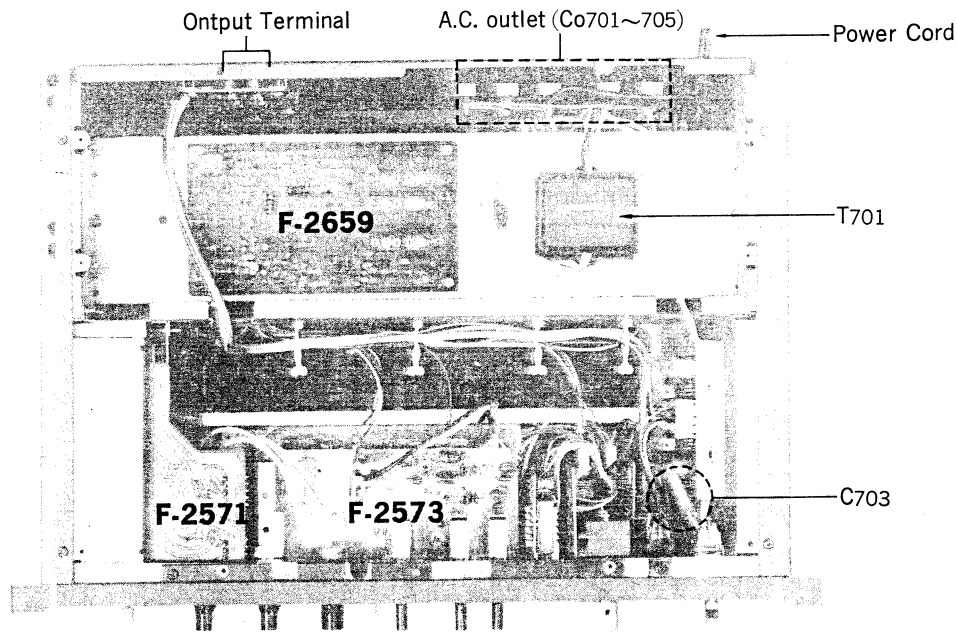
5. OTHER PARTS

5-1. Top & Bottom View

Top View



Bottom View

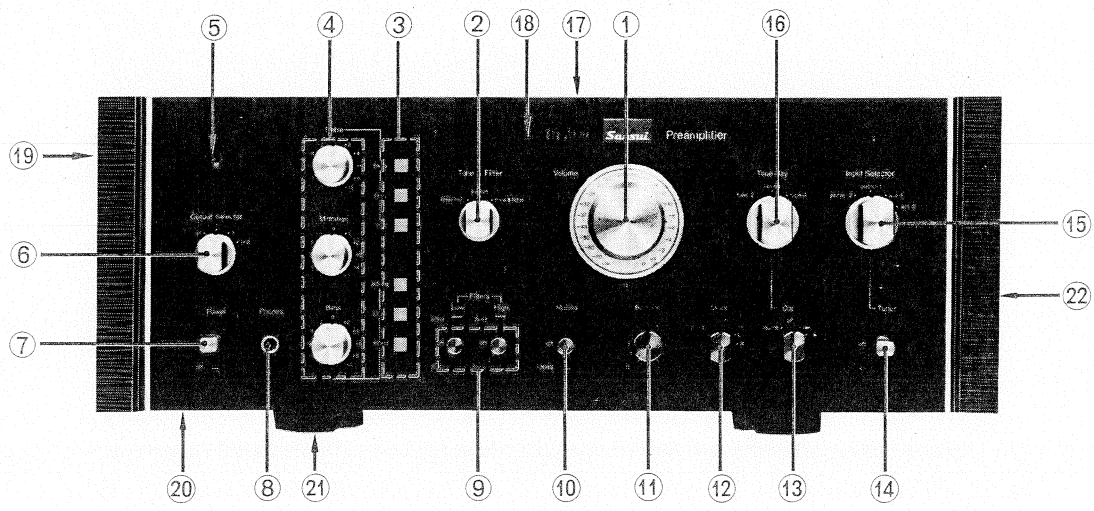


Parts List

Parts No.	Stock No.	Description
F701	0432220	1A 250V (AC 220V~240V)
	0432240	2A 250V (AC 100V~120V)
CO701~705	2450060	AC outlet
	2300060	Power Fuse Holder
	2290150	Ground Terminal
	2410091	Voltage Selector Plug
	2410830	Voltage Selector Socket
	3800240	Power Cord

Parts No.	Stock No.	Description
	4002550	Power Transformer
C703	0659801	0.01μF 150V C.C.
	2430260	Famale Pin Jack (White)
	2430270	Famale Pin Jack (Red)
	5287411	Input Terminal Base
	1110310	Pick-up Load Switch
	1110310	Sensitivity Switch
	2090030	DIN Jack

5-2. Front View



Parts List

Parts No.	Stock No.	Description
1	5318800	G-6 Type Knob, Level Volume
	1090220	100kΩ × 4 4-gang detent level volume
2	5318262	C-6 Type Knob, Tone & Filter Switch
	1190290	Tone & Filter Switch
3	1131150	Treble Tone Push Switch
	1131140	Bass Tone Push Switch
4	5318253	B-6 Type Knob, Treble Volume
		B-6 Type Knob, Midrange Volume
		B-6 Type Knob, Bass Volume
	1090150, 1	50kΩ (B) × 2 Treble Volume
		50kΩ (B) × 2 Midrange Volume
		50kΩ (B) × 2 Bass Volume
5	7726170	LED Ass'y, Protector indicator
6	5318262	C-6 Type Knob, output selector
	1101770, 1	Rotary Switch, output selector
7	5326510	E-2 Type Knob, power switch
	1170510	Lever Switch, power switch
	5047470	Masking, lever switch
8	2430170	Headphone Jack

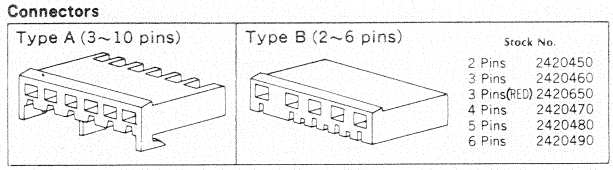
Parts No.	Stock No.	Description
9	5326520	E-3 Type Knob, filter & muting switch
	1170950	Low Filter Switch
		High Filter Switch
	5047470	Masking, lever switch
10	5326520	E-3 Type Knob, filter & muting switch
	1170950	Muting Switch
	5047470	Masking, lever switch
11	5318271	D-6 Type Knob, balance volume
	1015170, 1	250kΩ (M.N) × 2, Balance Volume
12	5318281	F-6 Type Knob, mode switch
	1190250	Mode Switch
13	5318281	F-6 Type Knob, Tape Copy Switch
	1190280	Tape Copy Switch
14	5326510	E-2 Type Knob, Tuner Switch
	1170870	Lever Switch, tuner
	5047470	Masking, lever switch
15	5318371	H-6 Type Knob, Input Selector
	1190260	Input Selector Switch
16	5318371	H-6 Type Knob, Tape Play Switch

Parts No.	Stock No.	Description
16	1190270	Tape Play Switch
17	5006630	Metal Bonnet
18	7007460	Panel Ass'y
	6906480	Spring, push knob
	5326530	Push Knob
	5286721	Knob Guide
	5286731	Lever Guide for 1 Contact
	5286741	Lever Guide for 2 Contacts
	5336581	Sansui Mark
19	5006640	Left Side Bonnet
20	5058700	Bottom Plate
21	5517050	Leg
22	5006650	Right Side Bonnet

5-3. Figures

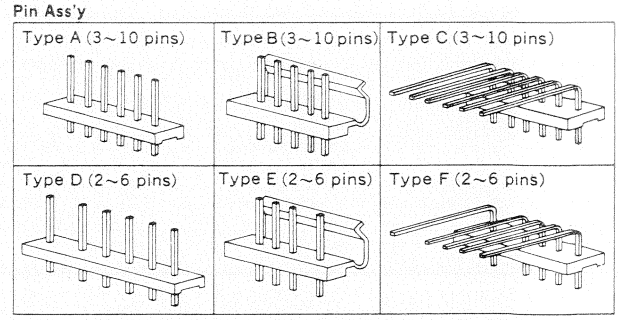
Connectors & Pin Ass'y

Connectors



NOTE: Since stock number of famale connectors (type B) with wires are not shown in each parts list of Complete circuit board, please refer to the above parts list when ordering the connector.

Pin Ass'y



Abbreviations

C.R.	:	Carbon Resistor	**E.C.**	:	Electrolytic Capacitor
S.R.	:	Solid Resistor	**BP.E.C.**	:	Bi-Polar Electrolytic Capacitor
Ce.R.	:	Cement Resistor	**C.C.**	:	Ceramic Capacitor
M.R.	:	Metallized Film Resistor	**Mi.C.**	:	Mica Capacitor
F.R.	:	Fusing Resistor	**O.C.**	:	Oil Capacitor
N.I.R.	:	Non-Inflammable Resistor	**P.C.**	:	Polystyrene Capacitor
M.C.	:	Mylar Capacitor	**E.C.**	:	Tantalum Capacitor

6. SCHEMATIC DIAGRAM

* La présentation et les spécifications sont susceptibles d'éter modifiées sans préavis par suite d'améliorations éventuelles.
* Anderungen, die dem technischen Fortschritt dienen, bleiben vorbehalten.
* Design and specification subject to change without notice for improvements.